

## DPH-9.1 Report on Overlap Consistency (interswath)

The USGS Lidar Base Specification Version 1.3 states: "Overlap consistency is a measure of the geometric agreement of two overlapping swaths, and a fundamental measure of the quality of the calibration or boresight adjustment of the data in each lift. It is of particular importance because the match between the swaths of a single lift is a strong indicator of the geometric quality of the overall dataset, establishing the quality and accuracy limits of all downstream data and products. The principles used with swaths can also be applied to the overlap between lifts and projects as well. Overlap consistency will be assessed at multiple locations within overlap in nonvegetated areas of only single returns. Assessment is limited to areas of <10-degree slope. To the degree that the data allow, test areas should be located such that the full width of the overlap is represented. The overlap areas that will be tested are those between the following:

- (1) Adjacent, overlapping parallel swaths within a project,
- (2) Cross-tie swaths and a sample of intersecting project swaths in both flight directions; and
- (3) Adjacent, overlapping lifts.

Each overlap area will be evaluated using a signed difference raster with a cell size equal to the ANPS, rounded up to the next integer, then doubled. The difference rasters will be statistically summarized to verify that RMSD<sub>z</sub> values do not exceed the limits set forth in the 'Swath overlap' column of Table 2 for the QL of information that is being collected."

**Table 2.** Relative vertical accuracy for light detection and ranging swath data.

[QL, quality level; RMSD<sub>z</sub>, root mean square difference in the z direction; m, meter; ≤, less than or equal to]

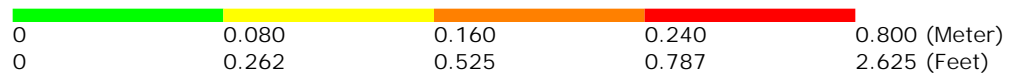
Quality level	Smooth surface repeatability, RMSD <sub>z</sub> (m)	Swath overlap difference, RMSD <sub>z</sub> (m)
QL0	≤0.03	≤0.04
QL1	≤0.06	≤0.08
QL2	≤0.06	≤0.08
QL3	≤0.12	≤0.16

The purpose of this section is to show a thematically rendered map of a flightline separation raster for all of the data processed. Processing has been done to isolate measurements either to specific classes of points or to clusters of single returns (depending on the method selected), limited within areas of <10 degree slope. The colors are graduated by the selected QL's swath overlap difference RMSD<sub>z</sub> limits. Only overlap areas are shown in the raster. The color is overlaid on a lidar intensity background to show land cover features. The swath overlap difference RMSD<sub>z</sub> values are reported on the following page(s).

## DPH-9.1 Report on Overlap Consistency (interswath) - continued

[Data Source - Y:\Mapping\Projects\65220171\\_USGS-TX\\_West\\_Texas\Production\Final\\_Client\\_Deliverables\Lot8\\_utm13\point\\_cloud\Swaths](#)

[Result Path - Y:\Mapping\Projects\65220171\\_USGS-TX\\_West\\_Texas\Admin\OA\\_OC\Lot8\DPH\\_9\\_1\FlightlineSeparation\\_SingleFile\\_Measurable\\_GRID.jp2](#)



A maximum vertical separation cutoff has been applied to this graphic for the purpose of masking out disruptive features that do not show calibration issues between flight lines (e.g., trees, moving cars, etc.).

## *DPH-9.1 Report on Overlap Consistency (interswath) - continued*

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02170	CS_02553	103655440.464	103922223.307	24558990.034	0.020 / 0.065
CS_02170	CS_02240	103655440.464	103236049.652	26116649.356	0.016 / 0.052
CS_02365	CS_02464	6491436.966	6418561.918	3591101.270	0.031 / 0.101
CS_02365	CS_02301	19765487.673	19660307.334	3677007.764	0.032 / 0.105
CS_02365	CS_02405	6453778.786	5393054.048	2938646.444	0.024 / 0.079
CS_02365	CS_02425	19349736.950	21048489.840	3725704.677	0.037 / 0.122
CS_02641	CS_02675	4605356.236	4736164.285	2198602.655	0.027 / 0.088
CS_02641	CS_02688	20739647.949	21165729.080	3822373.606	0.034 / 0.112
CS_02641	CS_02592	20419262.878	20875190.814	3840578.333	0.044 / 0.145
CS_02641	CS_02721	4785176.376	4837478.488	2763270.534	0.027 / 0.088
CS_02345	CS_02229	6397915.566	6789505.378	4155493.628	0.021 / 0.068
CS_02345	CS_02301	10977209.505	11138847.642	5739212.306	0.021 / 0.070
CS_02345	CS_02405	133351511.345	132682655.702	22115939.178	0.023 / 0.075
CS_02345	CS_02278	133586576.523	134224045.208	21913557.684	0.023 / 0.075
CS_02257	CS_02186	104511134.386	104124763.467	21332851.591	0.020 / 0.066
CS_02257	CS_02324	104526738.045	103731354.750	22417865.699	0.019 / 0.064
CS_02294	CS_03031	5706569.176	5259160.717	3272212.534	0.020 / 0.065
CS_02294	CS_02359	17435657.056	17691326.977	3711145.029	0.025 / 0.082
CS_02294	CS_02222	17592585.403	14026310.478	3312895.879	0.029 / 0.095
CS_02294	CS_02275	4717205.456	2846493.902	1922920.989	0.024 / 0.079
CS_03031	CS_02359	6857340.897	6619591.470	3265765.358	0.022 / 0.071
CS_03031	CS_02403	138226535.857	138115813.371	25014062.026	0.025 / 0.083
CS_03031	CS_02275	137507869.550	136394492.186	25356841.064	0.023 / 0.077
CS_02325	CS_02388	103396650.145	103628056.733	30514710.766	0.022 / 0.071
CS_02325	CS_02258	103428214.898	104093450.777	13631940.925	0.023 / 0.075
CS_02325	CS_02965	10747489.340	17923778.110	3496439.623	0.034 / 0.112
CS_02325	CS_02925	16163270.944	24461799.206	8389224.810	0.034 / 0.113
CS_02260	CS_02326	85150730.973	85114084.898	27693345.991	0.019 / 0.064
CS_02260	CS_02327	104503002.007	103739975.231	31815102.618	0.022 / 0.072
CS_02260	CS_02189	103904341.935	104296511.330	34156793.770	0.021 / 0.068
CS_02225	CS_02625	6318184.933	6376589.200	4158406.186	0.017 / 0.056
CS_02225	CS_02574	6180329.580	6336415.109	3153450.649	0.020 / 0.067

# DPH-9.1 Report on Overlap Consistency (interswath) - continued

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02225	CS_02297	17616566.564	18062597.111	3336888.707	0.026 / 0.085
CS_02225	CS_02156	18001266.740	17189655.209	3635751.370	0.029 / 0.095
CS_02268	CS_02197	102636465.520	102471191.599	18995940.013	0.019 / 0.062
CS_02268	CS_02002	102711986.302	102978607.283	20699260.313	0.018 / 0.059
CS_02764	CS_02719	128921692.792	129667792.965	24137503.628	0.026 / 0.084
CS_02764	CS_02421	4279604.215	5591123.567	3215710.213	0.018 / 0.060
CS_02764	CS_03028	137334987.196	134032559.652	24283850.500	0.023 / 0.075
CS_02764	CS_09000	8072604.437	8256513.161	1465481.582	0.024 / 0.080
CS_02764	CS_02099	6191554.067	6823471.031	3462030.704	0.018 / 0.060
CS_02464	CS_02405	133288157.435	132181573.230	21716242.301	0.022 / 0.074
CS_02464	CS_02425	5092714.951	4576900.171	2353796.872	0.035 / 0.114
CS_02464	CS_02521	134105801.191	131805504.979	20304781.780	0.023 / 0.076
CS_02400	CS_02338	103066318.927	103449565.434	19413464.839	0.018 / 0.058
CS_02400	CS_02458	102734848.008	103078191.421	21047641.741	0.019 / 0.062
CS_02361	CS_02297	18126315.576	18088163.997	3716509.799	0.019 / 0.062
CS_02361	CS_02421	18187558.995	17983555.524	3236292.645	0.028 / 0.091
CS_02361	CS_09000	6279284.740	6533580.985	3986215.852	0.020 / 0.064
CS_02361	CS_02673	6214500.955	6224286.730	3147477.541	0.014 / 0.045
CS_02390	CS_02748	66460916.843	100646039.948	42489790.749	0.027 / 0.088
CS_02390	CS_02067	31444990.965	30973263.144	10548760.997	0.018 / 0.060
CS_02390	CS_02327	66460916.843	66933601.510	21119086.743	0.024 / 0.077
CS_02700	CS_02652	103148288.830	104122762.506	21457824.208	0.018 / 0.060
CS_02700	CS_02744	103774766.310	104597021.561	20919745.142	0.020 / 0.064
CS_02553	CS_02605	104120794.049	104047937.179	25021627.669	0.020 / 0.064
CS_02625	CS_02574	136771696.361	137912731.093	24503786.482	0.025 / 0.081
CS_02625	CS_02297	3735750.369	4705763.415	2106081.272	0.014 / 0.047
CS_02625	CS_02673	136771696.361	137403868.687	24981376.459	0.025 / 0.083
CS_02034	CS_02515	90076135.022	103258100.130	20852953.995	0.020 / 0.064
CS_02034	CS_02075	85782953.637	40219402.761	15748371.802	0.018 / 0.059
CS_02034	CS_02622	102575.096	5762048.872	662698.368	0.021 / 0.068
CS_02506	CS_02447	104192981.534	104059127.239	23650188.948	0.021 / 0.070

## DPH-9.1 Report on Overlap Consistency (interswath) - continued

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02506	CS_02965	2679348.365	4851408.575	1174300.033	0.032 / 0.106
CS_02506	CS_02562	104192981.534	103842256.934	24625958.514	0.021 / 0.068
CS_02652	CS_02029	104122762.506	103411277.520	21892276.735	0.023 / 0.076
CS_02264	CS_02331	103806058.287	102650352.649	20772218.418	0.020 / 0.066
CS_02264	CS_02193	103531785.015	102735309.958	20330865.684	0.021 / 0.068
CS_02515	CS_02622	2293397.435	945180.993	1785833.880	0.018 / 0.057
CS_02515	CS_02458	101662349.362	102686787.036	19323846.824	0.020 / 0.066
CS_02447	CS_02388	103918011.518	103606772.512	28573002.902	0.019 / 0.064
CS_02447	CS_02965	4403328.031	6049033.399	3417822.698	0.034 / 0.113
CS_02576	CS_02627	132601040.790	131485720.188	19179950.183	0.024 / 0.078
CS_02576	CS_02521	132564252.857	131797281.856	20679725.735	0.022 / 0.072
CS_02576	CS_02539	5148153.431	4582173.443	2453562.385	0.033 / 0.109
CS_02576	CS_02483	6207923.569	6447191.436	3580898.990	0.029 / 0.094
CS_02197	CS_02129	102563205.090	102546672.387	20778593.126	0.019 / 0.061
CS_02229	CS_02301	19172047.381	19660307.334	3528520.067	0.026 / 0.084
CS_02229	CS_02278	7073720.095	5735193.551	3157206.732	0.018 / 0.059
CS_02229	CS_02160	17463255.411	18054300.219	3590064.822	0.023 / 0.076
CS_02153	CS_02204	4940.912	826113.182	542483.125	0.032 / 0.106
CS_02153	CS_02222	7205339.582	28212441.126	3630294.561	0.022 / 0.072
CS_02627	CS_02675	131474048.615	131606616.153	20262953.356	0.022 / 0.073
CS_02627	CS_02592	6435811.327	7519575.523	3714835.469	0.030 / 0.097
CS_02627	CS_02539	5066526.170	4845732.713	2977020.208	0.029 / 0.096
CS_02271	CS_02338	102521535.017	103449565.434	21139997.551	0.017 / 0.056
CS_02271	CS_02200	102601744.593	103051109.196	19685872.840	0.017 / 0.055
CS_02331	CS_02394	102650352.649	103190190.638	20430358.190	0.019 / 0.062
CS_02326	CS_02189	509984734.098	510063983.328	19492151.515	0.017 / 0.057
CS_02326	CS_02259	85114084.898	85352847.504	27084902.568	0.017 / 0.055
CS_02566	CS_02617	103028518.236	102839396.725	19723960.179	0.019 / 0.061
CS_02566	CS_02394	103012703.252	103300638.859	20411956.298	0.020 / 0.065
CS_02662	CS_02614	103917471.735	103928199.416	29822714.956	0.019 / 0.063
CS_02662	CS_02710	104102598.745	104002835.073	31234576.671	0.020 / 0.064

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Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02675	CS_02592	6958001.039	7385951.522	4067155.398	0.029 / 0.097
CS_02675	CS_02721	131997804.470	132930780.993	18917845.773	0.025 / 0.082
CS_02748	CS_02067	69929500.050	47271774.499	30129917.102	0.017 / 0.056
CS_02748	CS_02327	304786051.246	204490582.520	964728.216	0.025 / 0.082
CS_02748	CS_02655	154925767.007	154965134.440	29275145.043	0.024 / 0.078
CS_02574	CS_02156	10631493.120	11741266.168	3302394.019	0.033 / 0.109
CS_02574	CS_02519	137666741.142	137470830.974	25470750.579	0.025 / 0.083
CS_02301	CS_02405	11313172.203	10681677.189	7715988.279	0.024 / 0.078
CS_02688	CS_02555	21442330.988	21306176.707	13796285.902	0.029 / 0.095
CS_02688	CS_02721	5077969.047	4412334.058	2370730.571	0.028 / 0.091
CS_02561	CS_02505	103154570.389	103410306.786	28523573.522	0.019 / 0.063
CS_02561	CS_02613	103265437.038	103586620.879	27465486.426	0.019 / 0.064
CS_02744	CS_02789	104566936.817	102637185.898	22644490.914	0.019 / 0.062
CS_02096	CS_02156	17896158.024	16989980.816	3447877.155	0.033 / 0.107
CS_02096	CS_02519	6942321.163	7531193.622	4744839.835	0.028 / 0.093
CS_02096	CS_02462	7033330.832	7232004.950	3397582.442	0.026 / 0.085
CS_02096	CS_02476	17909212.408	18008479.926	3483572.996	0.033 / 0.107
CS_02555	CS_02607	154806658.250	155595826.572	30049331.194	0.024 / 0.080
CS_02555	CS_02721	137279415.175	132073763.893	23359381.192	0.026 / 0.086
CS_02592	CS_02539	21858301.136	20986949.736	4075385.777	0.041 / 0.134
CS_02187	CS_02123	104734254.673	104420228.272	26122910.422	0.023 / 0.076
CS_02187	CS_02258	104734254.673	104020285.026	30079481.658	0.022 / 0.073
CS_02187	CS_02965	11871281.650	16720080.156	4087414.534	0.040 / 0.131
CS_02187	CS_02925	17546127.153	25444370.713	9747022.014	0.043 / 0.140
CS_02614	CS_02562	103928199.416	103886754.164	24712507.537	0.021 / 0.069
CS_02075	CS_02134	1919697.971	180797.326	188011.986	0.025 / 0.083
CS_02067	CS_02327	47268053.683	46753906.843	15796143.480	0.019 / 0.062
CS_02373	CS_02310	103384858.400	101407240.702	26189346.029	0.017 / 0.055
CS_02373	CS_02491	102262460.695	103542098.609	26471754.448	0.017 / 0.057
CS_02297	CS_02673	5289093.887	4938541.243	3211362.082	0.011 / 0.036
CS_02204	CS_02222	1531063.610	3135432.790	2955472.138	0.029 / 0.094

## *DPH-9.1 Report on Overlap Consistency (interswath) - continued*

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02204	CS_02275	49199511.738	136394492.186	24679376.823	0.023 / 0.077
CS_02719	CS_02673	129622528.845	129092010.477	22893512.711	0.029 / 0.094
CS_02338	CS_02622	226779.495	142806.215	1085545.333	0.017 / 0.056
CS_02123	CS_02661	104468267.510	103025124.908	23665098.179	0.023 / 0.075
CS_02123	CS_02965	2862254.804	7510063.218	3511264.346	0.035 / 0.116
CS_02425	CS_02521	5292527.793	5754104.654	3372703.671	0.030 / 0.099
CS_02425	CS_02483	21179541.413	21713099.867	4036344.068	0.032 / 0.105
CS_02359	CS_02403	6825952.047	6958507.275	4523160.689	0.021 / 0.069
CS_02359	CS_02476	17916740.803	17494940.090	3454293.571	0.029 / 0.095
CS_02521	CS_02483	4687818.581	6682452.526	3245094.239	0.026 / 0.085
CS_02240	CS_02310	103192280.865	101407240.702	26491382.121	0.017 / 0.056
CS_02029	CS_02126	102727643.729	103557698.693	20363355.009	0.021 / 0.069
CS_02661	CS_02965	5521796.974	10588857.554	17615.353	0.057 / 0.187
CS_02661	CS_02613	103025124.908	104106214.838	27322916.255	0.021 / 0.067
CS_02186	CS_02122	104124763.467	104798823.049	20937924.229	0.019 / 0.064
CS_02388	CS_02965	5594651.866	8968973.543	3783980.792	0.039 / 0.128
CS_02789	CS_02547	102609027.003	103962727.761	23850714.695	0.019 / 0.061
CS_02324	CS_02387	103674110.026	103794615.832	23771902.332	0.019 / 0.062
CS_02258	CS_02965	5583320.200	9990677.070	3337684.390	0.029 / 0.094
CS_02258	CS_02925	16530461.168	25444370.713	16704824.861	0.032 / 0.106
CS_02421	CS_09000	4351742.799	4646412.280	2222959.596	0.023 / 0.075
CS_02421	CS_02099	17983555.524	18088038.301	3601088.721	0.023 / 0.075
CS_02122	CS_02605	104830044.091	104047937.179	23480029.493	0.024 / 0.078
CS_03028	CS_02099	6821300.362	7116038.948	4113145.983	0.019 / 0.062
CS_03028	CS_02278	134032559.652	134588324.818	21568257.909	0.021 / 0.068
CS_03028	CS_02160	4780701.815	4865791.155	2323442.445	0.023 / 0.074
CS_09000	CS_02673	8282918.361	8531951.058	1637485.935	0.022 / 0.071
CS_02539	CS_02483	20425547.563	21000926.618	3687459.379	0.040 / 0.131
CS_02965	CS_02925	10745970.461	10902075.945	5377476.063	0.031 / 0.102
CS_02126	CS_02193	103482769.238	102735309.958	20745954.619	0.020 / 0.067
CS_02710	CS_02755	104002835.073	103956222.742	33904219.200	0.019 / 0.063

# DPH-9.1 Report on Overlap Consistency (interswath) - continued

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1 (square Meter)	Area 2 (square Meter)	Overlap Area (square Meter)	RMSDz (Meter/Feet)
CS_02446	CS_02505	100921196.862	206212455.592	22376417.162	0.018 / 0.059
CS_02446	CS_02387	50252755.627	103777942.656	25850656.906	0.018 / 0.060
CS_02188	CS_02259	104536901.753	104644548.255	32430203.538	0.017 / 0.056
CS_02188	CS_02755	104534528.890	103956222.742	32679725.964	0.019 / 0.064
CS_02607	CS_02655	156156165.853	154810983.607	28534559.916	0.025 / 0.082
CS_02222	CS_02275	76168.330	5470333.053	4439100.221	0.026 / 0.084
CS_02189	CS_02259	104296511.330	104613829.593	32876450.237	0.019 / 0.062
CS_02156	CS_02519	4605325.776	4623879.316	2102787.666	0.031 / 0.100
CS_02617	CS_02070	102652598.034	102428125.052	20811861.595	0.019 / 0.063
CS_02099	CS_02160	17334343.991	17768227.903	2971834.514	0.023 / 0.076
CS_02519	CS_02462	137958115.943	138396848.393	24949112.506	0.027 / 0.087
CS_02132	CS_02073	102696400.448	102686091.737	19282232.584	0.017 / 0.057
CS_02132	CS_02200	102726121.346	103653899.964	20887825.154	0.017 / 0.055
CS_02547	CS_02491	103511842.171	103542098.609	25704941.781	0.018 / 0.058
CS_02129	CS_02070	102509324.302	102428125.052	18428075.095	0.018 / 0.059
CS_02403	CS_02462	138115813.371	138199845.324	25770599.994	0.024 / 0.080
CS_02403	CS_02476	3969034.129	4866694.469	2028620.697	0.020 / 0.064
CS_02073	CS_02032	102686091.737	103273453.328	20703729.339	0.018 / 0.059
CS_02278	CS_02160	5221272.446	5265087.505	3373967.219	0.015 / 0.049
CS_02002	CS_02032	102978607.283	103273453.328	19806587.452	0.017 / 0.056
CS_02462	CS_02476	5401943.447	5291713.183	3351407.050	0.023 / 0.076
Aggregate					0.021 / 0.069



# DPH-9.1 Report on Overlap Consistency (interswath) - continued

The purpose of this section is to show a frequency distribution chart of RMSDz values.

